What is claimed is:

1. A method for determining the endpoint of an etch process, comprising:

(a) providing a substrate comprising a material layer having a thickness;

(b) etching the material layer on the substrate;

(c) directing radiation onto the substrate as the material layer is etched, where the radiation has a wavelength that is on the order of the thickness of the material layer;

(d) measuring a change in intensity for radiation reflected from the substrate at a pre-selected wavelength as the material layer is etched; and

(e) terminating the etch step upon measuring a predetermined metric for the change in intensity of radiation reflected from the substrate at the pre-selected wavelength.

2. The method of claim 1 wherein the radiation has a wavelength within a range from about 200 to 800 nm onto the substrate.

3. The method of claim 1 wherein the thickness of the material layer is 5 to 300 Angstroms.

4. The method of claim 1 wherein the thickness of the material layer is less than or equal to the wavelength of the radiation.

5. The method of claim 1 wherein step (c) comprises:

directing the radiation substantially perpendicular to the material layer;

and

modulating the intensity of the directed radiation.

6. The method of claim 1 wherein step (d) comprises:

filtering wavelengths other than the pre-selected wavelength.

7. The method of claim 1 wherein the predetermined metric is associated with measuring a predetermined change in intensity for the reflected radiation at the pre-selected wavelength.

8. The method of claim 1 wherein the predetermined metric is associated with measuring a substantially constant intensity for the reflected radiation as a function of time at the pre-selected wavelength.

9. The method of claim 7 wherein measuring the predetermined change of intensity for the reflected radiation is associated with removal of the material layer from the substrate.

10. The method of claim 8 wherein measuring the substantially constant intensity for the reflected radiation as a function of time is associated with removal of the material layer from the substrate.

11. A method for determining the endpoint for etching a gate dielectric layer of a transistor, comprising:

(a) providing a substrate comprising a gate dielectric layer having a thickness;

(b) etching the gate dielectric layer on the substrate;

(c) directing radiation onto the substrate as the gate dielectric layer is etched, where the radiation has a wavelength that is on the order of the thickness of the gate dielectric layer;

(d) measuring a change in intensity for radiation reflected from the substrate at a pre-selected wavelength as the gate dielectric layer is etched; and

(e) terminating the etch step upon measuring a predetermined metric for the change in intensity of radiation reflected from the substrate at the pre-selected wavelength.

12. The method of claim 11 wherein the thickness of the gate dielectric layer is less than or equal to the wavelength of the radiation.

13. The method of claim 11 wherein the gate dielectric layer comprises at least one film of hafnium dioxide (HfO_2) and hafnium silicate ($HfSiO_2$).

14. The method of claim 11 wherein the thickness of the gate dielectric layer is about 5 to 300 Angstroms.

15. The method of claim 11 wherein step (c) comprises:
directing radiation having wavelengths within a range from about 200 to 800 nm onto the substrate.

16. The method of claim 11 wherein step (c) comprises:
directing the radiation substantially perpendicular to the gate dielectric layer; and
modulating the intensity of the directed radiation.

17. The method of claim 11 wherein step (d) comprises:
filtering wavelengths other than the pre-selected wavelength.

18. The method of claim 11 wherein the predetermined metric is associated with measuring a predetermined change in intensity for the reflected radiation at the pre-selected wavelength.

19. The method of claim 11 wherein the predetermined metric is associated with measuring a substantially constant intensity for the reflected radiation as a function of time at the pre-selected wavelength.

20. The method of claim 18 wherein measuring the predetermined change of intensity for the reflected radiation is associated with removal of the gate dielectric layer from the substrate.

21. The method of claim 20 wherein measuring the substantially constant intensity for the reflected radiation as a function of time is associated with removal of the gate dielectric layer from the substrate.

22. An apparatus for determining the endpoint of an etch process, comprising:
a source of radiation to illuminate a substrate disposed on a substrate pedestal during the etch process, where the radiation has a wavelength that is on the order of a thickness of a material layer on the substrate that is to be etched;

a detector to receive radiation reflected from the material layer at a pre-selected wavelength during the etch process; and

a means for measuring an intensity for the reflected radiation at the pre-selected wavelength, wherein the etch process is terminated upon measurement of a predetermined metric for a change in intensity of radiation reflected from the material layer at the pre-selected wavelength.

23. The apparatus of claim 22 wherein the source radiates and the detector receives radiation having wavelengths within a range from about 200 to 800 nm.

24. The apparatus of claim 22 wherein the thickness of the material layer is 5 to 300 Angstroms.

25. The apparatus of claim 22 wherein the thickness of the material layer is less than or equal to the wavelength of the radiation.

26. The apparatus of claim 22 wherein the source directs the radiation substantially perpendicular to the substrate.

27. The apparatus of claim 22 wherein the means filters wavelengths other than the pre-selected wavelength.

28. The apparatus of claim 22 wherein the predetermined metric is associated with measuring a predetermined change in intensity for the reflected radiation at the pre-selected wavelength.

29. The apparatus of claim 22 wherein the predetermined metric is associated with measuring a substantially constant intensity for the reflected radiation as a function of time at the pre-selected wavelength.

30. The apparatus of claim 28 wherein measuring the predetermined change of intensity for the reflected radiation is associated with removal of the material layer from the substrate.

31. The apparatus of claim 29 wherein measuring the substantially constant intensity for the reflected radiation as a function of time is associated with removal of the material layer from the substrate.

32. A computer-readable medium containing software that, when executed by a computer, causes a processing system to detect an endpoint of an etch process using a method, comprising:

(a) providing a substrate comprising a material layer having a thickness;

(b) etching the material layer on the substrate;

(c) directing radiation onto the substrate as the material layer is etched, where the radiation has a wavelength that is on the order of the thickness of the material layer;

(d) measuring a change in intensity for radiation reflected from the substrate at a pre-selected wavelength as the material layer is etched; and

(e) terminating the etch step upon measuring a predetermined metric for the change in intensity of radiation reflected from the substrate at the pre-selected wavelength.

33. The computer-readable medium of claim 32 wherein step (c) comprises:

directing radiation having wavelengths within a range from about 200 to 800 nm onto the substrate.

34. The computer-readable medium of claim 32 wherein the thickness of the material layer is 5 to 300 Angstroms.

35. The computer-readable medium of claim 32 wherein the thickness of the material layer is less than or equal to the wavelength of the radiation.

36. The computer-readable medium of claim 32 wherein step (c) comprises:

directing the radiation substantially perpendicular to the material layer; and

modulating the intensity of the directed radiation.

37. The computer-readable medium of claim 32 wherein step (d) comprises:
filtering wavelengths other than the pre-selected wavelength.

38. The computer-readable medium of claim 32 wherein the predetermined metric is associated with measuring a predetermined change in intensity for the reflected radiation at the pre-selected wavelength.

39. The computer-readable medium of claim 32 wherein the predetermined metric is associated with measuring a substantially constant intensity for the reflected radiation as a function of time at the pre-selected wavelength.

40. The computer-readable medium of claim 38 wherein measuring the predetermined change of intensity for the reflected radiation is associated with removal of the material layer from the substrate.

41. The computer-readable medium of claim 39 wherein measuring the substantially constant intensity for the reflected radiation as a function of time is associated with removal of the material layer from the substrate.